

What is Claimed is:

- [c1] A method of forming a gray scale image having a plurality of image pixels, comprising:
- selecting a neighborhood of image pixels;
 - determining color coordinates, including at least one of image pixel luminance, density and brightness, of the image pixels in the neighborhood;
 - determining a minimum vector and maximum vector for the pixels of the selected neighborhood of the color coordinate which corresponds to one of image pixel luminance, density and brightness;
 - determining a vector average of the maximum and minimum vectors;
 - determining a vector difference between the maximum and minimum vectors; and
 - determining a signed single component pixel using the maximum and minimum vectors, the determined vector average and the determined vector difference; and
 - determining a threshold based on the signed single component gray pixel.
- [c2] The method according to claim 1, further comprising:
- determining system noise; and
 - testing whether the vector difference is greater than the determined system noise and minimum feature contract limits.
- [c3] The method of claim 2, further comprising applying static, single component thresholding if the vector difference is not greater than system noise.
- [c4] The method of claim 1, wherein the color coordinates are specified in one of CIE X,Y,Z; L^*, a^*, b^* ; Y^*, u'', v'' ; U^*, V^*, W^* ; S, θ , W^* ; C,M,Y; C,M,Y,K; $Y'Cb'Cr$; NTSC Y,I,Q; H,S,I; H,S,V; CIE R,G,B; and NTSC R_N, G_N, B_N color coordinate systems.
- [c5] A system for forming a gray scale image comprising image pixels, comprising:
- a that selects a neighborhood of image pixels;
 - a color coordinate determiner that determines color coordinates, including at least one of image pixel luminance, density and brightness of the image pixels in the neighborhood;
 - a vector analyzer that determines a minimum vector and a maximum vector

for the pixels in the selected neighborhood of the color coordinate which corresponds to one of image pixel luminance, density and brightness;
a vector averager that determines a vector average of the maximum and minimum vectors;
a vector difference determiner that determines a vector difference between the maximum and minimum vectors;
a gray value determiner that determines a signed single component gray pixel using the maximum and minimum vectors, that determines vector average and the determined vector difference; and
a threshold adapter that determines a threshold based on the signed single-component gray pixel.

[c6] The method according to claim 5, further comprising:
a noise analyzer that determines system noise; and
a comparator that compares the vector difference luminance to the system noise and an estimate of the vector difference magnitude to a minimum feature contrast.

[c7] The system of claim 5, further comprising a static thresholding unit applied when the comparator that indicates that the vector difference is not greater than the system noise.

[c8] A method of determining a threshold for thresholding color image values, comprising:
selecting a neighborhood of image pixels;
determining color coordinates, including at least one of image pixel luminance, density and brightness of the image pixels in the neighborhood;
determining a minimum and maximum vectors for the pixels of the selected neighborhood of the color coordinate which corresponds to one of image pixel luminance, density and brightness; and
determining a vector average of the maximum and minimum vectors;
determining a vector difference between the dependent maximum and minimum vectors; and
determining a signed single-component gray pixel using the maximum and

minimum vectors, the determined vector average and the determined vector difference; and

determining a threshold based on the signed single-component gray pixel.

[c9]

A system for determining a threshold for thresholding color image pixels, comprising:

a window usable to select a neighborhood of image pixels;

a color coordinate determiner that determines color coordinates, including at least one of image pixel luminance, density and brightness of the image pixels in the neighborhood;

a vector analyzer that determines the dependent minimum and a maximum vector for the neighborhood pixels of the color coordinate which corresponds to one of image pixel luminance, density and brightness;

a computer that determines a signed single-component gray pixel using the maximum and minimum vectors, the determined vector average and the determined vector difference; and

a threshold adapter to determine the threshold based on the signed single-component gray pixel.

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